DRAGONFLIES AND DAMSELFLIES (ODONATA) OF THE NATIONAL FORESTS IN ALABAMA[1]

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ABSTRACT: Odonate surveys were conducted on National Forest lands in Alabama between 1994 and 1997. We collected 124 species representing all ten families and 71% of the species known to occur in the state. The number of species collected in any one National Forest ranged from 62 to 88. Seventy new county records were documented during this survey. National Forest lands in Alabama may serve as a refugium for odonate species with specialized larval habitat requirements or that are sensitive to habitat disturbances.

There are four National Forests in the state of Alabama, the Bankhead, Conecuh, Talladega, and Tuskegee (Fig. 1). These National Forest lands comprise over 267,000 hectares, or approximately 3% of the state's area (U. S. Forest Service, 1994), and are distributed in the state across four physiographic regions: the Cumberland Plateau, Alabama Valley and Ridge, Piedmont Upland and East Gulf Coastal Plain. Most of the freshwater habitat types in Alabama are represented in one or more of its National Forests, and these lands are semiprotected and relatively undisturbed.

The Bankhead National Forest covers about 72,800 hectares of Franklin, Lawrence, and Winston counties in northwest Alabama and is located in the Cumberlands Plateau physiographic region. The headwater tributaries and upper reaches of the Sipsey Fork, the major watercourse in the Bankhead, are protected under the National Wild and Scenic Rivers Act of 1963.

The Conecuh National Forest is located on approximately 34,000 hectares of the lower East Gulf Coastal Plain physiographic region in Covington and Escambia counties in extreme southern Alabama. This Forest contains several aquatic habitats which are very rare in Alabama, such as pitcher plant bogs and small, natural sand-bottomed ponds.

The Talladega National Forest is the largest forest in Alabama, encompassing about 157,800 hectares in two disjunct divisions. The Talladega/Shoal Creek Division is located in Calhoun, Clay, Cleburne, and Talladega counties in northeast Alabama. This division includes the southernmost foothills of the Appalachian Mountains and it lies within the Piedmont Upland and the Alabama Valley and Ridge physiographic regions. The Oakmulgee Division is located in west-central Alabama in Bibb, Chilton, Dallas, Hale, Perry, and Tuscaloosa counties and lies almost entirely within the East Gulf Coastal Plain

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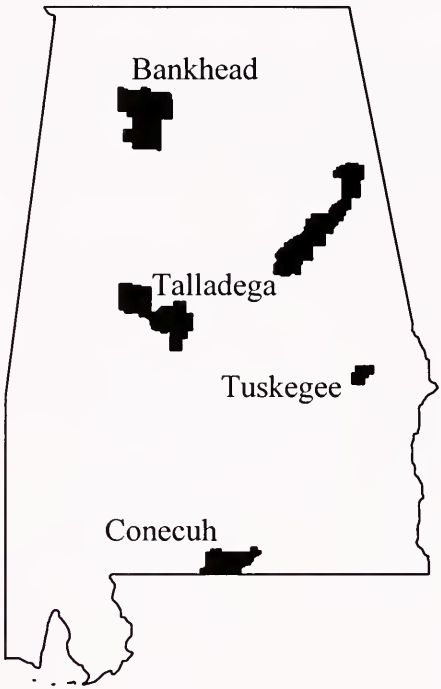

Figure 1. Map of Alabama showing the location of the National Forests.

physiographic region. A small portion of this division lies along the Fall Line Hills separating the Coastal Plain from the Alabama Valley and Ridge and is a "mixing zone" of northern and southern faunal elements.

The Tuskegee National Forest, Alabama's smallest forest, encompasses about 4,400 hectares in Macon County in southeast Alabama. All aquatic habitat within this forest lies in the East Gulf Coastal Plain physiographic region.

In recent years, Forest Service personnel in Alabama have begun to systematically document the aquatic resources on National Forest lands within the state (L. McDougal, pers. comm.). As part of this effort, and to supplement a publication on the distribution of odonates in Alabama (Tennessen et al., 1995), odonate surveys were conducted on National Forest lands in Alabama between 1994 and 1997. We present here a checklist of odonates from the four National Forests in the state of Alabama.

MATERIALS AND METHODS

Potential collection localities were identified by studying topographic maps, reviewing historical location data, and consulting with other biologists familiar with the National Forests. A wide variety of aquatic habitats was sampled including headwater seepage areas, small headwater streams, medium to large creeks, small rivers, large and small impoundments, and natural ponds. In addition, substantial time was spent searching along dirt roads and open fields to collect individuals that were foraging or had not yet returned to the breeding habitat. Adult odonate collections were made at approximately monthly intervals throughout the flight season (generally, March through October).

Adult odonates were collected using an aerial net; larvae were collected by kicknetting in appropriate habitat or by collecting exuviae (shed larval exoskeletons) by hand after emergence. Sight records were utilized for many of the more common or easily identifiable species. No sight records were included, however, if (1) voucher specimens of that species had not been collected from within the boundaries of the National Forest, and (2) identification to the species level with 100% certainty could not be made.

Larvae and exuviae were preserved and stored in 70% isopropanol. Adults were preserved by immersion in acetone and stored dry in envelopes. Voucher specimens are being maintained as part of the authors' permanent collection.

Nomenclature follows Garrison (1991) with the following exceptions from Tennessen et al. (1995): (1) *Stenogomphurus* Carle is treated as a subgenus of *Gomphus* Leach rather than being recognized as a separate genus; (2) *Gomphus brimleyi* Muttkowski is treated as a subspecies of *cavillaris* Needham; (3) the genera *Epicordulia* Selys and *Tetragoneuria* Hagen are treated as subgenera of the genus *Epitheca* Burmeister; and (4) *Ladona* Needham is treated as a genus separate from *Libellula* Linnaeus.

RESULTS AND DISCUSSION

Sampling on National Forest lands resulted in the collection of 124 species of odonates, representing all ten families and 71% of the 174 species known to occur in Alabama. The number of species collected per forest ranged from 62 in the Bankhead to 88 in the Talladega, or from 35% to 50% of the state's fauna. Thirty-nine species of damselflies were collected, mostly members of the family Coenagrionidae. Eighty-five species of dragonflies were collected; the families most commonly encountered included Libellulidae and Gomphidae. Seventy new county records were documented during the survey. The species collected, along with the National Forests in which they were found, the approximate flight season of the adults, and new county records are given in Table 1.

Fifty-seven of the odonate species collected during this survey are largely confined to lentic habitats such as ponds, lakes, and swamps within the National Forests; forty-three other species are usually restricted to flowing streams of various sizes. Eleven species are considered generalists that can exist in lentic or lotic habitats. The remaining twelve species are specialized to inhabit spring-fed seepage areas or sheet flow swamp thickets in the larval stage (Tennessen et al., 1995).

Seven of the species collected during this survey are, to date, restricted within Alabama to National Forest lands. These species are *Lestes vidua* Hagen, *Amphiagrion saucium* (Burmeister), *Gomphus australis* Needham, *Gomphus cavillaris brimleyi* Muttkowski, *Progomphus bellei* Knopf & Tennessen, *Didymops floridensis* Davis, and *Somatochlora calverti* Williamson & Gloyd. In addition, *Epitheca spinosa* (Hagen) and *Neurocordulia alabamensis* Hodges, two species not collected in Alabama in at least fifty years, were "rediscovered" on National Forest lands. Of these nine species, seven are known or believed to have specialized larval habitat requirements that are discussed below.

Amphiagrion saucium is a small red and black damselfly occurring from northern Georgia, Alabama, and Mississippi northward to Minnesota and eastward to Maine; the species also occurs in several Canadian provinces (Westfall & May, 1996). Populations of this species tend to be localized, probably due to a limited, scattered preferred habitat, which is usually spring fed, peaty bog margins or sphagnum-bordered spring seepage trickles. The only known Alabama population occurs at a sphagnum trickle near Blue Girth Creek, in the Talladega National Forest. This locality is just above the Fall Line and likely represents the southern terminus of the species' overall range.

Gomphus australis occurs in the southeastern coastal states from North Carolina to Mississippi (Dunkle, 1989), where the larval habitat is sand-bottomed natural lakes and ponds that are often fringed with water lilies (Tennessen et al., 1995). During this survey the species was collected at Otter Pond, Conecuh National Forest.

Gomphus cavillaris brimleyi, another inhabitant of natural sand-bottomed lakes or ponds on the Coastal Plain, has previously been reported from Florida and North Carolina (Dunkle, 1989). Several males were collected from Blue Pond and Open Pond, Conecuh National Forest, during April of 1993 and 1994.

Progomphus bellei was described based on specimens from Florida and North Carolina (Knopf & Tennessen, 1980). The typical habitat of this species is natural sand-bottomed ponds and tiny sandy seepage streams on the Coastal Plain (Tennessen et al., 1995). Three male specimens were collected at Little Creek, Conecuh National Forest, during this survey.

Didymops floridensis, a species which inhabits sand-bottomed lakes edged with emergent grasses and bald cypress (Dunkle, 1989), was thought to be endemic to Florida. A single male specimen collected in April 1994 at Blue Pond, Conecuh National Forest, represents the first record of this species from outside that state.

Epitheca spinosa is a rare early spring species which usually inhabits wooded swamps with little flow (Tennessen et al., 1995). A single male specimen was collected from Otter Pond, Conecuh National Forest, in March 1994.

Somatochlora calverti was previously known only from Florida and South Carolina. The breeding habitat of this Coastal Plain species is unknown but is thought to be boggy forest seepage trickles (Franz, 1982). Several adults of both sexes were collected along a Forest Service gravel road in the Conecuh National Forest in July 1995.

Thirty of the 123 species collected during this survey were found to be restricted to one specific National Forest. This may be in part due to limited collecting effort, and additional sampling should reveal the presence of some of these species in other National Forests in Alabama. However, some real differences among the odonate faunas of the individual forests in the state exist. The Conecuh National Forest contains unique coastal plain habitats, such as pitcher plant bogs and small natural ponds, not found in the other National Forests. Of the seventeen species collected only in the Conecuh National Forest, at least twelve are known to utilize these unique areas for breeding and larval habitats. Similarly, four of the nine species that were collected only in the Talladega National Forest occur in upland areas of the eastern United States and reach the southern limit of their range in Alabama in the foothills of the Appalachian Mountains, a portion of which lies within this forest.

The species collected during this survey represent approximately 71% of the total known Alabama odonate fauna, an impressive percentage in light of the fact that the National Forests comprise a mere 3% of the state's land area. In addition, the National Forest lands of Alabama may represent a refugium for those species that have specialized larval habitat requirements, as discussed previously, or that are especially sensitive to disturbance of their habitat. The

Gomphidae, for example, are primarily lotic obligates that require fairly pristine, undisturbed habitat, and the family contains a high percentage of species considered to be rare (Tennessen et al., 1995). Twenty-six of the forty gomphid species known to occur in Alabama were collected during this survey, indicating the presence of high quality lotic habitat within the National Forest lands of Alabama.

Table 1. Species list of Odonata from the National Forests in Alabama.

Species list	Bankhead	Conecuh	Talladega	Tuskegee	Adult Flight Dates
Suborder Zygoptera (39)					
Family Calopterygidae (5)					
Calopteryx angustipennis (Selys)	X		X		May - June
Calopteryx dimidiata Burmeister		X	X		April - September
Calopteryx maculata (Beauvois)	X	X	X	X	April - September
Hetaerina americana (Fabricius)[w]	X	X	X		August - September
Hetaerina titia (Drury)[p]		X	X	X	July - October
Family Lestidae (5)					
Lestes disjunctus australis Walker[h,l]	X	X	X	X	April - October
Lestes inaequalis Walsh [w]	X	X	X	X	April - June
Lestes rectangularis Say			X	X	April - September
Lestes vidua Hagen		X			January
Lestes vigilax Hagen *in* Selys[h,m,w]	X	X	X	X	April - October
Family Coenagrionidae (29)					
Amphiagrion saucium (Burmeister)			X		April - May
Argia apicalis (Say)	X		X	X	June - September
Argia bipunctulata (Hagen) [m,w]	X	X	X	X	April - September
Argia fumipennis fumipennis (Burmeister)		X			April - October
Argia fumipennis violacea (Hagen)	X		X	X	April - October
Argia moesta (Hagen)	X	X	X	X	June - October
Argia sedula (Hagen)		X	X	X	August - October
Argia tibialis (Rambur) [w]	X	X	X	X	June - August
Argia translata Hagen *in* Selys	X		X		August
Chromagrion conditum (Selys) [c]			X		May
Enallagma aspersum (Hagen)	X				June
Enallagma basidens Calvert [l]	X		X		June
Enallagma concisum Williamson		X			April - July
Enallagma daeckii (Calvert) [h]	X	X	X		April - July
Enallagma divagans Selys	X	X	X	X	April - June
Enallagma doubledayi (Selys) [m]		X		X	March - October
Enallagma dubium Root [m]		X		X	April - September
Enallagma exsulans (Hagen) [w]	X		X	X	May - September
Enallagma geminatum Kellicott [m,w]	X	X	X	X	March - October
Enallagma signatum (Hagen) [m]	X	X	X	X	March - September
Enallagma traviatum Selys [m]	X	X	X	X	April - July
Enallagma vesperum Calvert [m]		X	X	X	April - August

Species list	Bankhead	Conecuh	Talladega	Tuskegee	Adult Flight Dates
Ischnura hastata (Say) [b,m,w]	X	X	X	X	March - October
Ischnura kellicotti Williamson [m]		X	X	X	March - October
Ischnura posita posita (Hagen) [w]	X	X	X	X	March - October
Ischnura ramburii (Selys) [m]		X		X	April - October
Nehalennia gracilis Morse		X	X		May - June
Nehalennia integricollis Calvert [h,m,w]	X	X	X	X	April - September
Telebasis byersi Westfall [h,w]	X		X		June - July
Suborder Anisoptera (85)					
Family Aeshnidae (9)					
Anax junius (Drury) [w]	X	X	X	X	March - October
Anax longipes Hagen [m]		X		X	April - August
Basiaeschna janata (Say)	X		X	X	March - May
Boyeria vinosa (Say)	X	X	X	X	June - October
Coryphaeschna ingens (Rambur)		X			April
Epiaeschna heros (Fabricius) [m]	X	X	X	X	March - October
Gomphaeschna antilope (Hagen) [m]		X	X	X	April - May
Gomphaeschna furcillata (Say) [m,p]		X	X	X	March - May
Nasiaeschna pentacantha (Rambur)		X		X	April - July
Family Petaluridae (1)					
Tachopteryx thoreyi (Hagen *in* Selys)	X	X	X		April - June
Family Gomphidae (26)					
Aphylla williamsoni (Gloyd)		X	X		July - August
Arigomphus pallidus (Rambur)		X			April
Dromogomphus armatus Selys [p]		X	X		June - August
Dromogomphus spinosus Selys	X	X	X	X	May - August
Erpetogomphus designatus Hagen *in* Selys [m]				X	August - September
Gomphus apomyius Donnelly			X	X	May
Gomphus australis Needham		X			April
Gomphus cavillaris brimleyi Muttkowski		X			April
Gomphus dilatatus Rambur		X			July
Gomphus exilis Selys [m]	X	X	X	X	March - June
Gomphus geminatus Carle		X			April
Gomphus hodgesi Needham		X			April - May
Gomphus hybridus Williamson			X		April
Gomphus lineatifrons Calvert	X		X		May - June
Gomphus lividus Selys [w]	X		X	X	March - May
Gomphus parvidens Currie			X		May - June
Gomphus rogersi Gloyd			X		Larvae only[#]
Hagenius brevistylus Selys [w]	X	X	X	X	June - August
Ophiogomphus incurvatus alleghaniensis Carle			X		Larvae only[#]
Progomphus bellei Knopf & Tennessen		X			June - July
Progomphus obscurus (Rambur) [m]	X	X	X	X	May - August
Stylogomphus albistylus (Hagen *in* Selys)	X		X		May - June
Stylurus ivae (Williamson)		X	X		September
Stylurus laurae (Williamson)			X		August

Species list	Bankhead	Conecuh	Talladega	Tuskegee	Adult Flight Dates
Stylurus plagiatus (Selys) [w]	X	X			September
Stylurus townesi Gloyd		X			July
Family Cordulegastridae (3)					
Cordulegaster bilineata (Carle)		X	X		March - April
Cordulegaster maculata Selys [m]	X		X	X	March - May
Cordulegaster obliqua (Say)			X		July
Family Corduliidae (Macromiinae) (5)					
Didymops floridensis Davis		X			April
Didymops transversa (Say) [m]	X		X	X	March - May
Macromia alleghaniensis Williamson [w]	X		X		June - July
Macromia illinoiensis georgina (Selys)	X	X	X	X	June - October
Macromia taeniolata Rambur			X		August
Family Corduliidae (Corduliinae) (14)					
Epitheca costalis (Selys)		X	X	X	March - June
Epitheca cynosura (Say)	X	X	X	X	March - May
Epitheca princeps Hagen [w]	X		X		May - June
Epitheca spinosa (Hagen *in* Selys)		X			March
Helocordulia selysii (Hagen *in* Selys) [w]	X	X	X		March - April
Helocordulia uhleri (Selys) [w]	X		X		March - April
Neurocordulia alabamensis Hodges *in* Needham & Westfall		X	X		June
Neurocordulia molesta (Walsh)				X	Larvae only[#]
Neurocordulia obsoleta (Say)	X				Larvae only[#]
Somatochlora calverti Williamson & Gloyd		X			July
Somatochlora filosa (Hagen) [m]		X	X	X	July - October
Somatochlora linearis (Hagen) [m]			X	X	August
Somatochlora provocans Calvert [h]		X	X		June - August
Somatochlora tenebrosa (Say) [h]	X		X		June - October
Family Libellulidae (27)					
Celithemis amanda (Hagen)		X			June - October
Celithemis bertha Williamson		X			April - October
Celithemis elisa (Hagen) [m]		X		X	April - October
Celithemis fasciata Kirby [m,w]	X	X	X	X	April - September
Celithemis ornata (Rambur)		X			April
Celithemis verna Pritchard [h,m]		X	X	X	April - June
Dythemis velox Hagen [w]	X		X		June - September
Erythemis simplicicollis (Say) [w]	X	X	X	X	March - October
Erythrodiplax minuscula (Rambur)		X		X	April - October
Ladona deplanata (Rambur) [m,w]	X	X	X	X	March - May
Libellula auripennis Burmeister		X	X	X	April - October
Libellula axilena Westwood [m]		X		X	June - July
Libellula cyanea Fabricius	X		X	X	April - August
Libellula flavida Rambur	X	X	X	X	June - September
Libellula incesta Hagen	X	X	X	X	June - October
Libellula luctuosa Burmeister	X	X	X	X	June - September
Libellula lydia Drury	X	X	X	X	March - October
Libellula pulchella Drury [l]	X	X			May - September

Species list	Bankhead	Conecuh	Talladega	Tuskegee	Adult Flight Dates
Libellula semifasciata Burmeister		X		X	March - July
Libellula vibrans Fabricius	X	X	X	X	June - October
Pachydiplax longipennis (Burmeister)	X	X	X	X	March - October
Pantala flavescens (Fabricius)	X	X			July - October
Perithemis tenera (Say) [w]	X	X	X	X	May - September
Sympetrum ambiguum (Rambur)			X	X	September - October
Sympetrum vicinum (Hagen) [w]	X		X		June - October
Tramea carolina (Linnaeus) [b]		X	X	X	March - October
Tramea lacerata Hagen		X		X	April - October
Total	62	87	88	68	

[#] - No adult specimens were collected for these species; therefore, no adult flight dates are given.
[b] - New county record for Bibb County, Alabama
[c] - New county record for Chilton County, Alabama
[h] - New county record for Hale County, Alabama
[m] - New county record for Macon County, Alabama
[l] - New county record for Lawrence County, Alabama
[p] - New county record for Perry County, Alabama
[w] - New county record for Winston County, Alabama

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